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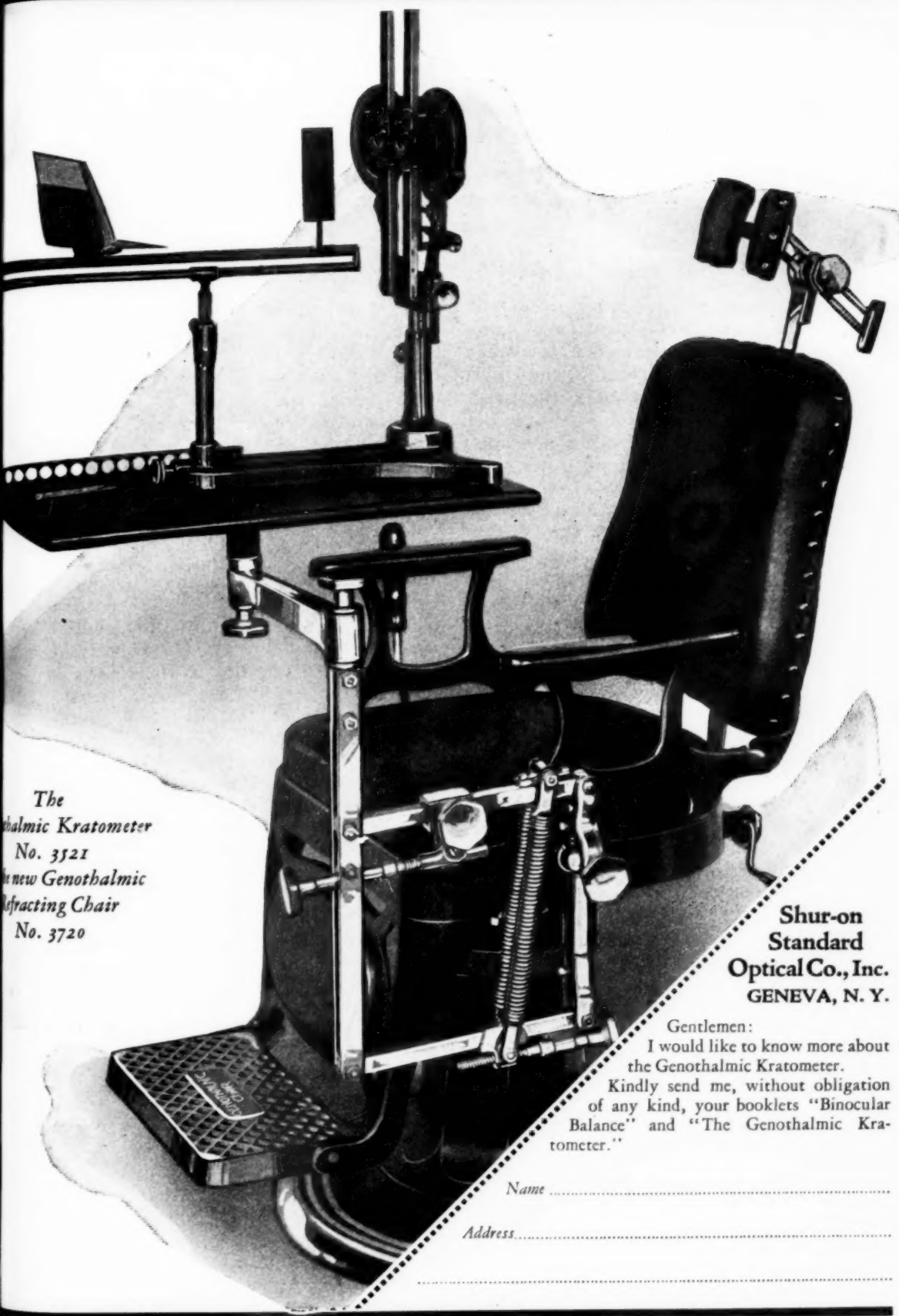

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OCULAR PSYCHOMETRY

Being an Outline of the Fundamental Principles Governing the Control of the Ocular Muscles.

Carl F. Shepard, O. D., D. O. S., and
Wm. Arthur Mendelsohn, Oph. D., Opt. D.
Chicago, Ill.

CHAPTER II.

Light from an object in space falls upon the retina in consequence of some change in environment. The eyes are adjusted to better receive the light from the object in question; the head, the arms, legs and body as a whole moves to a more favorable position; the emotions (fear, pleasure, etc.) are aroused, indicating (we are told) visceral adjustments; thoughts are awakened; and, finally, the events transpiring are indelibly recorded in the archives of memory. Some of these adjustments are seemingly independent of the others. For example, your eyes may investigate a moving object just beyond this page, and revert to the type again without disturbing your trend of thought; without arousing your emotions, and without any other apparent physical movement than that of the eyes. Common experience will verify the assertions that movement of some object in space is most effective in awakening such instantaneous readjustment of the eyes, and that normal eyes shift from the original object of regard to the second unerringly, without pausing to record any of the objects lying between the first and second position. In fact, such eye movements are usually accompanied by a winking of the lids, shutting out light from objects which would otherwise lie in the path of direct vision. Again introspection will convince anyone that such ocular adjustments proceed thought and awareness. We are aware that our eyes have moved, without having thought of moving them, and without being aware of the fact that they are moving during the actual adjustment.

Realizing that the retina is the tissue which receives external stimulation and starts the whole series of bodily responses, it is essential that the retina be studied with the actual facts of every day experience clearly in mind, with the aim of discovering, if possible, the details of structure which constitute the "triggers" for setting off the various reflexes. (The word "reflex" is here used in its technical sense, to designate the total process taking place over an arc.)[6]

For our present purpose we may forget the ten layers of the retina memorized for graduation purposes, and consider the retina as consisting of but three layers, or units, which we can best understand by borrowing terms now so familiar to thousands of radio fans. First, the retinal detector unit consists of the rods, cones, retinal pigment and rodopsin. Second, the first stage amplifying unit consists principally of the bipolar cells. Third, the second stage amplifying unit consists of the ganglionic cells, the axon fibers of which constitute the fibers of the optic nerve.

The best understood elements of the detector unit are the rods and cones. The rods are probably the more primitive cells. Their receiving ends appear to consist of almost infinitesimal discs so that the rod resembles a column of stacked coins. When light of any wave length within the limits of the visible spectrum falls upon or close to these discs, energy is released within the rod cell and tends to flow out of the end opposite the discs.[7]

The energy released within the cells of the body is called "nerve impulse," "nervicity," etc. All modern authorities show a tendency to accept the theory of this nerve force being a form of electricity.[8] In this series we shall use the name "nervicity," coined by Savage.

The cone cells are probably a higher development of the rod cells. The cone cell is more selective—that is, it responds better to certain wave lengths of light than to others, thereby making "color vision" possible. The cone cells have also developed a portion, known as the Cone Myoid (Myoid means "like a muscle") by means of which the cone thrusts its sensitive discs deeper into the pigment of the retina when exposed to strong light, withdrawing them again as the light grows dim.

At the fovea centralis, which is commonly referred to as the most sensitive portion of the retina, there are cone cells only. A little farther out, each cone is surrounded by a ring of rods. Still farther from the retina, beyond the macula, each cone is surrounded by five or six rings of rods; and so on, out to the periphery of the retina where both rods and cones are less numerous, but where the rods decidedly predominate.

The function of retinal pigment, and rodopsin is still a matter of conjecture. Most writers agree that at least part of their function is to insulate one cell from another, and to protect the rods and cones from excessive light.

From the rods and cones (1st unit) the nervicity flows to the bipolar cells in the amplifying section of the retina. (2nd unit.) There may be several rods communicating with a single rod-bipolar, but there is never more than two, and usually but one cone communicating with a single cone-bipolar. From this it becomes a logical conclusion that the intensity of the light upon the retina, and the color (wave length) of the light are the important factors in determining the strength of the nervicity stimulation to a cone-bipolar. But in the case of the rod-bipolar there is an added factor. Obviously if the area of the retina illuminated is so small that only one or two rods are stimulated to action, the nervicity delivered to the rod-bipolar will be much less than if the area of illumination were great enough to stimulate many of the several rods communicating with the one rod-bipolar; or if the point of light were moving across the retina so that one rod after another was stimulated, the rod-bipolar would receive an infinitely rapid series of charges of nervicity having as great or greater effect than if the illuminated area were large enough to cover many rod cells.

Within this amplifying section of the retina are "horizontal" cells receiving nervicity from, and probably communicating between, groups of rods and cones; and four other types of cells whose functions are not at all known, as they do not, apparently, communicate with the ganglionic cells.[9]

The second stage of amplification takes place in the ganglionic cells. Never more than two, and usually only one cone-bipolar communicates with a single cone-ganglion; so that each cone has, so to speak, a private wire to the brain. On the other hand, several rod bipolars may communicate with a single rod ganglion, so that as many as 250 rods may send their nervicity to the brain over a single optic nerve fiber.[10]

Summing up, we find the rods, by reason of their 250 to 1, relay to the brain are best suited to be the triggers for starting the train of cell activity which informs the brain of movement of objects not located in the direct line of vision. We find the cones, by reason of their "private wire" communication to the brain, best suited to start the activity which results finally in the normal "20/20" acuity of direct vision; and we understand why acuity should fall to approximately 20/100 when the image upon the retina is about 3° from the fovea, and to 20/250 at about 10° from the line of direct vision, etc., until the normal person has practically no "form" conception when the object is imaged upon the periphery of his retina.[11]

Again, the cones, by reason of the "cone myoid" are best suited to detect slight variations of light intensity; and as color perception is best where cones are most numerous,[12] all authorities agree that cones start the chain of responses resulting in color perception. Finally, as color and form perception diminish as the eye becomes "dark adapted"; while responses to movement increase, it is accepted that day vision is cone vision, while night vision is rod vision.

It will be seen that impulses from the retina to the brain reach the brain

as the total nervicity produced by at least three cells. Rod or cone + bipolar + ganglion nervicity. When we realize that the nergy delivered to the brain by other sensory nerves is often the output of but a single cell, we are able to understand how it is possible for the faint touch of light upon the retina to make as great an impression upon the brain as the substantial touch of matter upon the skin. The function of every nerve cell is the production of nervicity by the release of energy through combustion. Just as the production of electricity by a dry battery is a chemical process, so is the production of nervicity a chemical process, requiring the constant destruction of organic compounds, which must be replaced; and the constant accumulation of waste products, which must be eliminated. The tearing down process (katabolism) goes on constantly when the cell is being stimulated; the building up process (anabolism) is accomplished while the cell is resting. Work and rest—work and rest, is the ideal program for longevity and efficiency. Rhythmical alternation between light and darkness provides that ideal program for the retinal cells.

If, however, the rhythmical alternation is so rapid that the succeeding stimulation is produced before the effects of the first have entirely disappeared the second charge is added to the first. This is the law of summation of stimulation of which more will be said in later chapters.[13]

Every optometrist is familiar with the fact that the ganglionic fibers (optic nerve fibers) from the retina of each eye divide at the optic chiasma where the fibers from the right half of each retina go to the right half of the brain, and the fibers from the left half of each retina go to the left lobe of the brain, while some fibers from each macula go to each half of the brain.

In the next chapter we shall locate their terminations in the brain and discuss the activity resulting from the discharge of retinal nervicity into the brain.

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THE INADVISABILITY OF OCCLUSION TREATMENTS

Chas. I. Saks, Opt.D.
Syracuse, N. Y.

Lately there have been several articles submitted in our technical Journals concerning the treatment latent of muscular imbalances. The sponsors of this method claimed great success—but the writer of this article fails to understand just why this technic should be beneficial.

Occlusion of one eye for a certain period, depending on the case and personality of the patient, will break up binocular conditions. The function of convergence (positive and negative) which is so essential in our judgment of distance, size, speed, etc., is also broken up. Why wonder then that a higher amount of exophoria or hyperphoria will result when convergence or binocular conditions are broken up?

There is always present a certain amount of convergence even if the point of fixation is miles away. Nature has been good to us, by placing the maculae so, that convergence effort is reduced. When the point of fixation is approximately in the medial plane the incident rays, after refraction will be bent toward the nasal side.

Occlusion will break up convergence because it is no longer needed. It is only when the temporal field of each retina is stimulated simultaneously that convergence is brought into play to eradicate the diplopia. When one eye is covered, the temporal field of one eye only is stimulated resulting in a version. Also the harmony between the other extrinsic muscles will be lost in occlusion, because the desire to bring each retinal image on the fovea of each eye will be lost.

Now that occlusion of one eye has succeeded in breaking up convergence, it must be remembered that control over accommodation is also lost. Likewise the equilibrium between the nerve pathways of the intrinsic and extrinsic ocular muscles is also broken up. The lateral nucleus (voluntary division of the 3rd cranial nuclei) send fibres to the internal, superior and inferior recti and inferior oblique—each 3rd lateral nuclei sending fibres to muscles of the same side. The anatomical arrangement of the nerve fibres from the lateral nuclei to the above named extrinsic ocular muscles will at once show why a vertical phoria (mistakenly, I believe, called the latent hyperphoria) will probably result upon the breaking up of convergence and binocularity.

The lateral, vertical and oblique muscles are ever ready to adjust either eye (during binocular vision) so that an image is made to fall on each fovea. After taking so many years to build up this complicated ocular mechanism to give us the proper perspective when the head is held at various angles, then why attempt to break up such a highly skilled function?

Of course, the writer of this article has reference to cases only, where the vision of each eye is about the same and where there was no existing tropia.

How then should those cases with troublesome phorias and poor ductions be treated?

In those cases of exophoria due to exhaustion or convergence insufficiency (poorly developed convergence) the treatment resolves itself into proper rest and hygenic measures under the care of a physician, where necessary, and secondly base out treatments after the patent has received proper rest. In cases of physical breakdown temporary use of prism base In may be used,

In cases of esophoria, base In treatments only with prism base In incorporated in the prescription. If the patient is one who does close work all day, additional prism base In segments may have to be added for the near point work.

In those cases of hyperphoria the writer has found that Dr. Peckham's method is the only worthwhile thing to do, and his method is this: Do **not** give vertical prism in the position of rest in cases of hyperphoria. First take care of the lateral muscles, which

procedure will generally take care of the hyperphoria. Where the hyperphoria persists, give a weak prism about 0.50 P.D., the apex toward the direction of least action. For instance, suppose there is 3 degrees of persistent right hyperphoria. Give about 0.50 P.D. base up in front of O.D. As much as this may seem against your principles, but you will find that it works. Also—give vertical prism treatment in the latter case the treatments to be base up O.D. and base down O.S. The vertical ductions are low enough without giving vertical prisms in the position of rest in hyperphoria.

Quite a few optometrists put about 5 P.D. to 8 P.D. base In, in the trial frame before the patient's eyes and leave it there for about twenty minutes prior to the examination. This is very satisfactory provided diplopia is not brought about. In the writer's opinion, as much base In prism with which single binocular vision can be maintained should be used. If too much prism is used so that diplopia results, then equilibrium is lost, convergence no longer has control over accommodation, and the vertical and lateral muscles are thrown out of gear. The important point is this: We aim to give single binocular vision with the least amount of energy. The habit of binocular balance can be brought about **only** as long as single vision is maintained.

Those optometrists who add prism base In for pre-refraction purposes, until diplopia follows will disagree with the writer. It must be borne in mind, then when diplopia results, only one eye will see, that is, only one image will be given or can be given conscious attention for the discernment of detail.

Forcible suppression of one eye teaches the occluded eye to forget how to see during times of stress. A habit of suppression is thereby developed. Along with this suppression is developed a high exophoria because convergence relaxation is automatically brought into play because the function of convergence is not required when the vision in one eye is either suspended or suppressed. At the onset of this faulty habit vision will be voluntarily suppressed to prevent discomfort. Suppression will occur, so often, until it becomes an unconscious habit which resolves itself into our friend—suspenopsia.

Occlusion of one eye therefore will hinder one who must use his eyes for constant close work, where the convergence demands are high.

In conclusion the following procedure is suggested in troublesome heterophorias, poor ductions and general visual discomfort:

1. Do not resort to occlusion.
2. Treat the case binocularly—incorporating either prism base out or In (temporarily) with the proper exercises.
3. Vertical phorias to be treated as per Peckham's method, adverse vertical prism for temporary use along with innervational treatments of the vertical muscles.

COMMENTS ON REFLEX ACTION

David Levinson, Opt.D.
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There is no denying the fact that today the study and a knowledge of psychological phenomena is essential to the Optometrist, so as to facilitate the understanding of allied subjects of practical importance. Of all the phenomena I have in mind, I know of none having a more direct bearing than the reflex. Reflex action is something we encounter and must consider day after day, especially in the physiological field. The ever-perplexing question of accommodation and reflex action are closely linked, while in nearly every instance we unconsciously consider the quality of this "simplest form of nervous response."

Reflex action is "the original form of behavior among creatures possessing a nervous system. It involves the

operation of a single nervous arc or a number of such arcs acting together simultaneously." A winking of the eye, sneezing, a quick jerk of the hand if we are burned or stuck with a pin, a violent beating of the heart should we become frightened or suddenly shocked, are all practical forms of nervous response we encounter. There is the simple reflex, operating through a simple nervous arc, and there is the compound reflex, "in which two or more sensory impulses are combined, or in which a single sensory impulse finds multiple expression." The resultant action on the part of the compound reflex is more complicated and involved than is the case with the simple reflex. The path traveled by the simple reflex impulse is from sensory center to the motor center and thence on down the motor path to the particular muscle or gland involved, with consequent action. A compound reflex movement is from "the first sensory center to another (higher) sensory center before passing over the motor tract to the muscle or gland." The path traversed from sensory apparatus to the mechanism contributing response is known as the reflex arc.

Antagonistic and allied reflexes and alternating and supplementary reflexes are worthy of consideration. Here we have, in the compounding of reflexes, types in which we observe that, in antagonistic form the impulses are offered to muscles which furnish opposition to one another. In allied reflexes there prevails the spirit of cooperation, so that separate impulses "tend to reinforce one another."

The mere names applied to reflexes of the alternating and supplementary types are clear enough to explain, with little attendant discussion, the definitions applied. In alternating reflexes there is an observance of the laws of concerted action, with each reflex taking place in turn. Supplementary reflex action comes in connection with more or less "ordinary" occurrences.

In its physiological application, a point to be borne in mind, it seems, is that when the higher type of reflex is involved, an entering peripheral impulse may set into motion quite a few of the responsive machines, as is illustrated in the use of strychnine to increase the excitability of the neurons. "In such cases, the slightest stimuli, such as air, etc., suffices to throw the patient into convulsions."

It is doubtful if the perfect functioning of the human organism could be practically regulated without the employment of reflex action. Reflex action controls, or regulates, a great number of our physiological processes, thus relieving the individual of mental and physical effort in a great many instances. This bespeaks, besides protection, quick action, usefulness, regularity and ease of response.

We bring reflexes with us into the world. Reflexes are born with us, although they are to be distinguished from action that comes as a result of well formed acquired habits. These habits are hard to distinguish from reflexes, but they are not regular and as important as the automatic response sponsored by reflexes, so that it is possible to differentiate between habit and a normal reflex to be found in the big majority of people whose physiological functioning is not seriously impaired. The logical routine is to, of course, first test for the reflex, and, then, if it is absent or impaired, to trace the trouble. In the hospital, the familiar "knee reflex" is of importance. To the Optometrist, the testing of the pupillary reflex is of significance and is one of the first steps suggested in a routine examination of the eye.

OPHTHALMIC PROTECTIVE GLASSES

H. H. Emsley, B. Sc.
From the
Optician and Scientific Instrument Maker
(British)

In the light of recent events, it is not surprising that the optician is confused in this matter of protective glasses. In the first place, it seems strange to many people that protection of the eyes is necessary against sunlight, in the presence of which man has developed for quite a number of centuries and to which, it would be supposed, his eyes are in some measure adapted. Moreover, we have been persistently informed by eminent men of the great benefits to our bodies and our surroundings of as much sunlight as we can find in this country of ours.

On the one hand, we read of large installations for the production and utilization of artificial sunlight in our hospitals and clinics and of the provision of a glass specially made to allow the ultra-violet region of it, because of its desirable properties, to pass through. On the other hand, we are informed on two separate pages of the one issue of our technical paper, in the one place, that the ocular discomfort of a certain client arises not from the visible light, but from an excess of chemical (ultra-violet) light; and in the other place that sunlight does not contain a sufficient intensity of these ultra-violet radiations to cause any harm, but that a glass is required to reduce the excess of visible light evenly through the spectrum. Very interesting.

We remember, also, many of us, that quite undesirable skin irritations have been caused at the seaside by bright sunlight; and we hear of a recent report containing the information that the chief result derived from the artificial sunlight treatment appears to be the stimulation of the growth of hair on the part of the body exposed!

It requires some little adaptability to reconcile these views, to find the pea under the thimble, as it were; and the humour of the subject is not exhausted yet. Mr. L. Marsden, in his letter to The Optician (29th July, 1927), draws attention to the fact that the late Sir Wm. Crookes' researches revealed the danger of the infra-red radiation from incandescent sources such as molten glass, and thereby gives voice to the thoughts of many as to why the ultra-violet only should be persistently associated with "Crookes' glass."

Others besides Crookes have concluded that cataract, for example, follows the absorption of infra-red radiation. What is probably the most complete modern research on the subject of the effects of radiation on the eye has led to the conclusion that it is the infra-red of short wave length, and not the ultra-violet, that is responsible for most of the distressing physiological actions in the intra-ocular media.

A Difficult Research

The confusion of thought concerning the effects of radiation on the eye and the proper use of protective glasses is not due to lack of attention given to the subject. Research in this sphere can be traced back to the seventeenth century, and during the last forty years or so a large number of ophthalmologists and physicists have worked on the different aspects of the problem. It is worth while to include the names of some of these:

On the Continent:

Aschkinass, Birch - Hirschfeld, Brucke, Fieuzal, Hallauer, Helmholtz, Henker, Hertel, Herzog, Jamin, Knoblauch, Masson, Meyhofer, Schulek, Stearkle, Soret, Schanz, Stockhausen, Verhoeff, Voege, Vogt and his school, Widmark, Zsigmondy.

In America:

Bell, Bitner, Coblentz, Emerson, Gibson, Fehr, Ham, Luckiesh, McNicholas, Nutting, Sheard, Smith.

In England:

Crookes, Gage, Hartridge, Hill, Howe, Martin, E. K., Martin, L. C., Parsons, Tyndal.

There are two main parts to the problem:

(A) The determination of the effects on the eye of all regions of radiation from short wave ultra-violet, through the visible region, to long

wave infra-red—a physiological problem.

(B) The determination of the absorptive properties in these regions of radiation of glasses containing various known constituents—a physical problem.

In (A) it is necessary to make a distinction between (1) such effects as permanent or semi-permanent chemical or structural changes in the eye media, and (2) muscular strain and fatigue such as may result, for example, from excessive contrast or brightness.

The investigation of the subject is difficult, exceedingly so in the case of (A). Evidence as to the behaviour of living human eyes under the action of radiation is clearly not easy to obtain. It must be acquired either by indirect experiment, on animal eyes or dead human eyes, or by very careful and systematically coordinated statistical surveys.

Because of these difficulties and perhaps, in some cases, of the neglect on the part of some of the experimenters to provide adequate controls, it is not surprising to find their results in frequent conflict and to have experienced considerable difficulty in deciding what course to follow in the prescribing of protective glasses in those special circumstances where they are needed.

Investigations into the second, physical problem (B), do not present difficulties so formidable, and we are in possession of a considerable amount of useful information concerning the absorptive properties of a variety of glasses of known composition.

In view of the importance of this thought it may be of some service to subject to the optician and of the evident interest being taken in it, I attempt to set down very briefly such conclusions as appear to have been established by the labors of the above-listed experimenters. For what follows I am indebted to three main sources of information:

(1) The book, "Transmission of Radiant Energy by Ophthalmic Glasses," by C. Sheard, in which the work of many investigators has been collected.

(2) The paper, "Light Filters for Eye Protection," by L. C. Martin; Trans. Opt. Soc., 18 (1916-17), No. 3; a valuable summary of the conclusions of previous workers and an account of the careful experiments of Dr. Martin on various glasses.

(3) The paper, "Alfred Vogt's Researches on the Effects of Radiation on the Eye and its Parts," by H. Hartinger, in the Zeitschrift fur Ophth. Optik, 14, 1927, 5-6; an illuminating account of the important conclusions reached by Professor Vogt and his colleagues, chiefly as the result of work carried out since the war.

The work of Vogt will be summarized separately below. The immediately following statements are based upon the account, by Sheard and by Martin, of the work of the other investigators.

The following wave-length figures will be useful. One micro-millimetre ($m\mu$) is 10^{-6} mm.:—

	Wave-length ($m\mu$)
Shortest solar waves reaching the earth	290
Long wave ultra-violet, up to about	380
Violet limit of visible region, about	380
Blue region, round about	450
Green region	500
Yellow region	580
Red Region	650
Red limit of visible region, about	750
Short wave infra-red, up to about	1,250 (Vogt)
Long wave infra-red, up to about	100,000 (1/10 mm.)
Shortest electro-magnetic waves, about	3,000,000 (3 m m)
Maximum energy in sunlight, about	460

We may divide the whole of the spectrum of moment in the present inquiry, then, into five parts, somewhat as follows:—

	$m\mu$
Short wave ultra-violet, up to about	315
Long wave ultra-violet, about	315 to 380
Visible region, about	380 to 750
Short wave infra-red, about	750 to 1,250
Long wave infra-red, about	1,250 to 100,000

(Wave-lengths are expressed in micro-millimetres, $m\mu$.)

1. All the eye media appear to be transparent to radiation between about 660 and 390.

2. The cornea absorbs waves shorter than 295 and is fairly transparent to longer wave lengths.

3. The crystalline lens begins to absorb at about 400 to 380, and absorbs completely at 350.

4. Except for an absorption band between 250 and 280, the vitreous (in a layer 3/16 in. thick) seems fairly transparent.

5. It would appear that daylight is

practically incapable of harming the cornea.

6. Exposure of the eyes to an unshaded arc lamp produces fluorescence of the crystalline lens; with long, continued exposure, intense inflammation, with final opacity of the media of the eye, may result.

7. Low intensity ultra-violet light produces no permanent results.

8. Intense ultra-violet light is absorbed by the eye media and may produce corneal opacity, conjunctivitis and other phenomena (but see also the results of Vogt's work below).

9. Excessive ordinary illumination may become exceedingly exhausting, the effects being retinal and muscular.

10. Excessive contrast may have considerable effect on vision, due evidently to the non-adjustment of the adaptation of the eye to the circumstances. The sky viewed through a small window may give a contrast of 1 : 10,000, which would cause impaired vision and strain. To work with a small light in a dark room may lead to considerable strain.

11. Sir Wm. Crookes and others conclude that physiological actions follow the absorption of infra-red radiations, resulting in cataracts. The precise action of the radiations in producing opacity seems uncertain.

12. Most ordinary colored glasses transmit well in the infra-red. Glasses with an iron content are needed to absorb short-wave infra-red, *e. g.*, Crookes 202 (containing ferric iron and cobalt), and especially Crookes 246 (containing ferrous iron).

13. Ordinary colored glasses exhibit varying amounts of absorption in the ultra-violet and are very uncertain. Filters to absorb ultra-violet radiations are by no means a panacea for relieving eyestrain and glare.

It is admitted that the above summary is not particularly precise, although the optician can draw certain definite conclusions.

More positive conclusions seem to have been reached, however, by Vogt and his co-workers.

Vogt believes that the infra-red radiation of short wave-length is chiefly responsible for most of the harmful effects on the eye. In his 1912 paper (v. Graefes Arch. f. Ophth., 81, 155-188, 1912) Vogt gave a summary of previous researches on the infra-red and its effects. Since then he and his colleagues (Reichen, 1914, Ginella, 1924, Muller, 1924, Meyer, 1925, Trumpy, 1925, Bucklers, 1926) have, except for interruption due to the war, worked persistently with ample modern facilities on this problem. Their work thus provides the latest and probably the most comprehensive evidence available on the matter.

The work has been carried out, not only on the separate media of the eye, but on complete human eyes and also on the eyes of living animals, principally rabbits of various ages and breeds. For the infra-red radiation, 30 and 40 amp, arc lamps were used, with suitable filters for isolating the spectrum region desired, thermopile and Engelmann galvanometer for recording the effects. A mercury vapor lamp was also used for the ultra-violet. Special precautions were taken for cooling; the light was concentrated on the part of the eye being investigated by rock-salt or quartz lenses, as the case may be. Tests were made also on the absorption by various glasses.

The following brief statements are based upon the above-mentioned paper by H. Hartinger.

1. The media of the eye are transparent to such dark (infra-red) radiation as is emitted by white hot bodies. Radiation from red hot bodies traverse the media only in traces.

2. Of all the radiation from a 32 c. p. carbon filament lamp, about 20 to 25 per cent passes the cornea and about 3 per cent reaches the retina. About 4/5 of the total rays are dark and belong to the infra-red.

3. Glass, *e. g.*, spectacle glass, protects the eye only against long-wave infra-red and not against short-wave infra-red such as penetrates the eyeball.

4. A toxic effect of long-wave infra-red (of the outer parts of the eye) and of short-wave infra-red (on the iris) is experimentally established.

5. Total cataract of the lenses of living rabbits after three hours' exposure to infra-red mixed with red light down to 670 to 700 mμ, from a 30-amp. arc lamp, is experimentally established.

6. Short-wave infra-red mixed with

red light from a 40-amp. arc lamp produced the following effects:

(a) Paresis of sphincter,
(b) Clouding of aqueous,
(c) Paralysis of sphincter,
(d) Permanent de-pigmentation of iris,
(e) Ring formation on anterior surface of lens,
(f) Clouding of lens,
(g) Damage to retina and choroid.

7. Ferrous oxide glasses absorb appreciably the short-wave infra-red of wave-length about 800 to 1,250 and prevent the formation of cataract with an intense radiation of over three hours' duration, when eyes without this protection suffered appreciable damage in a few minutes.

8. Ophthalmoscopic examination of animals treated from one to three years previously with short-wave infra-red radiation showed that the induced cataract had meanwhile become of the lamellar type.

9. Exposure for 15 to 30 minutes to short-wave ultra-violet under 314 mμ caused violent inflammation of the conjunctiva and cornea which, however, subsided in 8 to 14 days. An iritis appeared several days after the exposure. The interposition of glasses that absorb ultra-violet under 314 mμ prevented the damage.

10. Exposure for many hours to high intensity ultra-violet and violet in the region 314 to 435.9 mμ caused no injury worth recording.

11. The ultra-violet radiation of daylight is to be taken consequently as physiological (als physiologisch gelten), and protection against this radiation is groundless. Only against ultra-violet under 314 mμ, which exists in arc light and in daylight on high mountains, is protection, by ferrous oxide glasses, serviceable. Injuries to the lens and retina, however, can be produced neither by short nor long wave ultra-violet.

Hartinger prefaces his paper by remarking on the curious circumstance that the ultra-violet has always occupied the foreground in connection with this subject, the infra-red having been regarded as harmless and consequently neglected. He concludes somewhat thus:

"Vogt's researches are certainly of particular significance in spectacle work. Through his extensive experimental researches * * * the question of the harmfulness of the several regions of radiation and the necessity for, or uselessness of, protective measures have been substantially clarified. His researches provide us with valuable knowledge of the effect on the eye of an almost neglected region of radiation, the infra-red. * * * It has even been attempted to provide the general public with ultra-violet absorbing spectacle glasses and, with the aid of extraordinary advertising, at least in English-speaking countries, with success."

Conclusion

On the available evidence as it stands, and subject to modification as further research may indicate, I believe I should divide clients into three main categories and act according to the following directions:

I. For normal eyes in normal conditions, indoors and outdoors, as we find them in this country, even including so-called bright sunlight, no protection whatever is necessary.

II. For normal eyes to be exposed to unusual natural illumination—high mountains, contrasts, snowfields, really bright sunlight, as at sea, etc.—and for eyes abnormally sensitive to brightness, prescribe a ferrous oxide glass of light to medium tint.

III. For eyes to be exposed to exceptional radiation, as in certain industrial occupations—blast furnace and glass workers, welders, those exposed to unshielded mercury light, etc.—prescribe a heavy tint ferrous oxide glass or one of the specially made welder's glasses.

For eyes exposed to X-rays, dense black.

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BRAIN ADAPTION AS RELATED TO OCULAR REFRACTION

In the disheartening, damnable haste to get the job done and collect the fee, I see the continuation of what I believe to be an evil and vicious practice. I refer to the ridiculous attempt to remove at a single stroke all the improper conditions that concern a pair of human eyes. A single examination, hurriedly done, a formula written with little or no regard for data acquired, delivery of the glasses, an instruction to return in several years for a re-examination, and a duty to humanity has been discharged. *O, temporax! O, mores!*

It seems it is the exception, rather than the rule, that any other procedure obtain. The formidable excuses usually given are that the public will not pay the price; that the public wants quick service; that present procedure has worked in the past (at what a cost in eyes and suffering, the Great Lord alone knows); and that the commercialists in our field of endeavor will not permit any drastic change!

I think we are all agreed that the patient who comes with a refractive error comes also with a muscle involvement. Does he usually come with anything else, except perhaps the usual plea of near insolvency? Indeed, he does. He comes with a more or less completely developed series of habits, —neural habits, brain habits, conscious and subconscious habits, whose co-relationship surely has been either strained, nearly broken, or entirely broken. He comes with disturbed powers of image interpretation, and with disturbed association centers and association paths. All of us, I think, are sufficiently aware that what has been said is so. And we attempt (most of us) to effect a cure at a single stroke.

It may be held that the difference between objective findings and subjective findings is the measure of the brain tort region. Therefore one must rely on the subjective findings as the formula for immediate needs. The better informed optometrist ventures into that tort region most often, fineness of judgment determining how deeply one should venture. A genius may safely gauge that depth distance in a large percentage of cases; yet, he is often aware that he is treading uncertain ground, resulting in disaster in not a few cases.

I hold we can have a great number of equivalent geniuses and not a few superlative geniuses were it not that we had to contend with time and false economy standards of the people of our day. It would generally be regarded as absurd to demand a change

of formula in a few weeks; then another change of formula several weeks later; and still a third and final change of formula some weeks later. That would involve four or five examinations and reexaminations, checks and rechecks, modifications and finding of judgment in dissipating faulty habits, inducing new and correct ones, and, finally permitting normal, balanced associations and internal nerve fluxes, so as to relieve brain and ocular tensions, and restoring a normal, healthy physiology. That would be too great a strain on the patient's pocketbook. Therefore, we gratuitously bear the brunt of criticism, the cost of exchanges, and develop the inferiority complex about which we hear so much. The patients who haven't the gumption to come back to challenge us and those who are phlegmatic enough to endure stoically the brain torts are legion. Let us not be deceived into thinking otherwise.

I know of business optometrists who as clever sales people can sell a patient several types of lens and frame combinations, at a cost to the latter in excess of a hundred dollars. As optometrists, we should not be so interested in styles in glasses or a dependence thereon to swell our profits. Fifty, seventy-five, or a hundred dollars should not be too much for a patient to pay for maximum safe vision with comfort coupled with a very fine insurance against trouble in the future. That amount divided by two or three years is after all not such a terrific burden on the person who needs our services; nor will that burden be as large, once the professional work has been well done.

Is it necessary that we go through the dreadfully slow processes of evolution through a long period of time to accomplish a purpose so highly beneficial to all concerned? The motive, to be sure, can be regarded as selfish; but it will not have been the first time that a selfish motive has gained great benefit for mankind.

You who read this editorial and who favor the underlying thoughts herein contained, will accomplish nothing in aid of the purpose unless you are willing to make a concerted effort to push it to a conclusion. The ways and means are obvious. I beg of you, let this matter not die of inanition.

Dr. W. H. Glazer.

THE BALTIMORE CLUB ANNOUNCES THE WINNERS OF THE HAZELL AWARD

The B. Woodard Hazell Award, which was offered by the Baltimore Optometric Club for the best essays on Hyperopia, its history, etiology, varities, prognosis, treatment and correction was awarded recently to the following men: Dr. R. L. Coffin, Baltimore, Maryland, First Prize. Dr. A. T. Liachovitz, Philadelphia, Pennsylvania, Second Prize, and Dr. J. I. Kurtz, Minneapolis, Minnesota, Third Prize.

The Baltimore Optometric Club is to be congratulated upon initiating this award as it is through mediums of this sort that optometrists as a professional group will be able to stimulate interest in, and work out and solve some of our puzzling optometric problems.

Other optometric organizations are urged to establish, wherever possible, awards for technical research, as this type of work will enrich both optometric science and literature.

We congratulate our colleagues upon receiving this honor,—the winning of the B. Woodard Hazell Award, and the Baltimore Club, for having the distinction of being the first American Club to inaugurate this splendid movement.

C. C. K.

DESTROY ALL SECOND QUALITY LENSES

Dr. J. Fred Andrae, Secretary of the International Board of Optometry Boards, and Dr. George M. Whitney, President of the Maryland Association of Optometrists have recently issued a call to the A. O. A., and to the Optical Manufacturers of America, to form a Joint Commission to discuss various problems, chief of which is the disposal of second quality lenses.

This is surely a needed piece of work and a commission could and should be appointed to review the matter.

As the matter now stands, these second, third and even poorer quality lenses are being sold by unscrupulous

jobbers under various trade names to either unsuspecting or indifferent, dispensing houses or to optometric practitioners direct. Some time ago a large portion of this trash was shipped abroad—to the detriment of the vision of the poor in Europe—a decidedly shabby practice, to be sure,—but now this export market no longer exists, and the manufacturers are permitting this inferior and in many, many cases harmful material to go forth to the American public.

In this the manufacturers cannot be wholly blamed. They are in business for what little profit can be secured, but if our large National Association were to assume a direct stand on the matter, the market for these inferior lenses would be, at least to an extent, removed, and with a bit of helpful cooperation on the part of the leaders of the profession it is by no means questionable that the solution would not be in sight.

In fact there is no reason why all second, third and poorer quality lenses should not be destroyed by the manufacturers themselves and a high tariff wall erected by Congress to protect the resultant American market, the cost of these two moves being added to the present cost of first quality lenses. Incidently this wouldn't add more than twenty-five cents a pair to the present wholesale price.

Optical material has for years been sold to the profession at prices far below its intrinsic worth, and the time is now ripe for a wholehearted revision of both price schedules and of business practices.

Andrae and Whitney have again, in their forceful way, brought the attention of the profession to a needed reform. We hope President Mayer of the A. O. A. will rise to his opportunities. C. C. K.

BOOK REVIEW

THE ANATOMY AND PHYSIOLOGY OF THE EYE.

Dr. Max Coque, B.Sc. Published by Messrs J. & R. Fleming, Limited, London.

This book has been written with a view of supplying a certain amount of desirable information of great value and interest to Optometrists.

In a foreword, Dr. J. H. Sutcliffe, Secretary of the English Optical Society and Editor of the British Journal of Physiological Optics, says that "few men can be so well equipped as Dr. Coque for the authorship of this book. Both as assistant to Professor Monoyer and as clinical assistant to the late Dr. Dor of France, Dr. Coque had unusual opportunities for amassing the store of knowledge that is set out in his book, which contains 458 pages."

Dr. Coque made a study of the stereoscope. There are to be found in the book fourteen stereoscopic views of the anterior of the eye and the orbit. Most of them were prepared under the personal supervision of Dr. Arthur Thompson, Professor of Human Anatomy at the University of Oxford.

The first five chapters deal mostly with the living tissues, such as connective tissue, muscular tissue, nervous tissue and nutrient tissue. The sixth chapter is devoted to pathology.

Part of the book deals with the action of light on living beings, general sensation and sense organs; evolution of the animal eye and the embryological development of the human eye. The specialized treatment of the eye, its appendages, its nervous apparatus and the microscopic structure of the optic nerve chiasma, optic tract and visual centers.

This book is a valuable addition to optometric literature. J. I. K.

ABSTRACT DEPARTMENT

The Iris. H. E. Smith. The Columbia Optometrist. Vol. I, No. 3, pp. 11-12. 1927.

Smith, writing on ocular diagnosis of the Anterior Chamber only, claims that when the Iris is clearly visible, and its lustre and color are unimpaired and when the pupil is normal in size and is quickly reactive to light, it is safe to assume that no disease is present and no other diagnostic tests need be made.

T. O. B.

The Relation of the Teeth to the Eyes. S. Levy. The North Carolina Optometrist. Vol. 1, No. 3.

Every organ in the body, says Levy, is so closely related that it is impossible for one organ to suffer without all suffering. Every organ of the body performs at the expenditure of nerve force sent from the brain to that organ. When the functions of any organ become perverted it is called disease. He uses this relationship from a pathological viewpoint because it is in this condition alone that it can be appreciated. Of course the same relationship exists in normal conditions, but there is no disturbance present in either part and it can not be appreciated or observed.

In this paper the author is especially interested in the relationship between the teeth and the eyes and to prove that this relationship is sufficiently important to justify our attention to this subject.

Disturbance of functions of any part, by and through the agency of another may be accomplished in two separate and distinct ways by the direct irritation of the terminal nerve endings of either of the parts, viz.: the eye or the teeth or by the more circuitous route of infectious processes, says Levy.

His contention is that a pathological disturbance in the eye can and does effect the normal functions of the dental mechanism just as surely as vice versa an oral manifestation of disease may effect normal functions of the eye. In considering the direct irritation of the terminal branches of the nerves it is a proven fact, he claims, that the proper functioning of the eye may quite distressingly be disturbed by a direct irritation of a terminal branch of some one of the dental nerves. The branches of which are all derived from the fifth pair cranial nerves, more commonly known as the trifacial or trigeminal. These conditions are produced by reflex action of those nerves which are made by the very intimate relationship which these branches bear to all other twelve cranial nerves. Motor, as well as sensory, through an anastomosis and commingling of their many branches and by direct connection through the many ganglia associated with them. The conditions thus produced in the eye may be temporary or more or less prolonged according to the severity or duration of the irritation applied to the dental nerve endings.

The deep origin of the motor roots of the fifth is from the floor of the fourth ventricle and aqueduct of Sylvius. Here are also the deep origin of the third, fourth, and sixth motor nerves of the eye and the ninth, tenth and twelfth pairs and though the third, fourth and sixth nerves are motor nerves and supply the muscles of the eye they also contain a few sensory fibres of a sort which are connected to the muscle spindles.

These nerves, therefore, carry both afferent and efferent impulses and can by the anastomosis of their branches with the fifth produce reflex pain and disturb muscle action. The fifth nerve supplies the teeth, the eye, nose and throat and most of the forehead and face with sensation.

The ophthalmic division is purely sensory and supplies the globe of the eye, lacrimal glands, mucous membrane of the eye and the nasal fossae, therefore irritation of its branches or that of any of the branches of the maxillary division, either by direct or reflex impulses, cause irritation or inflammation of the ocular or palpebral conjunctive or the cornea with pain lacrimation, photophobia or blepharo-spasm.

Reflex action may arise from any cause producing pain and commonly known as toothache. The peripheral nerve endings of the dental branches

of the fifth nerve are inside of the teeth themselves and circle all through the gums, pericemental membranes lining the sockets of the teeth, etc. These dental nerves may be irritated by traumatic injury, by bacterial and chemical disintegration of the tooth, forming cavities, which expose the nerves by the function of the pulp nodules from a deposition of lime salts directly in the nerve cavity, or by filling placed over an exposed nerve pressing upon it, by infected tissues about and around the tooth, such as gingivitis, percementitis, etc. Wherever these infections occur, says Levy, there is an intense, almost unbearable, pain which may directly affect the eye or the ear. He points out that we have a dental branch irritated in a lower molar and a pain felt in an upper tooth, neuralgia over the eye or under the eye, ear ache, eye pain, or sick stomach may occur, even mentality has been unbalanced, all done by reflex action or false messages of nerves.

He also mentions pathological conditions arising from infections. Many serious conditions, he claims, are known to arise in the human system from slow poisoning by absorption, or from small blind abscesses on the roots of devitalized teeth called granulomas. The roots of teeth under certain pathological conditions make an inviting place for foci of infection. Bacteria collect at these favorable points, encyst themselves and slowly poison the system. Cultures made from granulomas taken from such teeth nearly always produce the streptococcus Virdens and staphylococcus as well. These infections can produce many serious conditions in the eye, as ulcerated conditions, choroiditis, etc.

He further points out that infections may take place from any pathological or unhygienic condition of the gums such as pyorrhoea, alveolaris, interstitial gingivitis, Vincent's angina, chronic periostitis, etc. From these infectious conditions of the teeth, besides eye troubles, we may have rheumatism, arthritic joints, head troubles, affections of the kidneys, etc.

T. O. B.

SPECIAL REPORT

"NUDIS VERBIS"

"Therefore I pray him to proceed gently with me and form no judgment concerning these things until he shall have read all."—Spinoza.

Earl J. Deane, B.Sc., O.D.
Bloomsburg, Pennsylvania

A short time ago, while browsing about in my library, I was particularly attracted by the following paragraphs in one of Joseph Conrad's books.

"Now, the moral side of industry, the redeeming and ideal aspect of bread-winning, is the attainment and the preservation of the highest possible skill on the part of the craftsman. Such skill, the skill of technique, is more than honesty; it is something wider, embracing honesty and grace and rule in an elevated and clear sentiment, not altogether utilitarian, which may be called the honour of labor. It is made up of accumulated tradition, kept alive by individual pride, rendered exact by professional opinion, and, like all higher arts, it is spurred on and sustained by discriminating praise.

This is why the attainment of proficiency, the pushing of your skill with attention to the most delicate shades of excellence, is a matter of vital concern. Efficiency of a practically flawless kind may be reached naturally in the struggle for bread. But there is something beyond—a higher point—a subtle and unmistakable touch and love and pride beyond mere skill; almost an inspiration which gives to all work that finish which is almost art—which IS art.

As men of scrupulous honor set up a high standard of public conscience above the dead-level of an honest community, so men of that skill which

passes into art by ceaseless striving raise the dead-level of correct practice in the crafts. The conditions fostering the growth of that supreme, alive excellence ought to be preserved with a most careful regard lest the industry should perish of an insidious and inward decay."

The foregoing brought to my mind the question, "What are we older men doing to raise the dead-level of correct practice in our art and science, to preserve and improve that supreme and alive excellence which IS art, especially in our dealings with our young practitioners, they who must carry the torch when we pass on; are we, in these years when we say, 'The days are not many now,' giving any thought to the future of the young practitioner?"

These thoughts, following closely some experiences during the past year while advising and tutoring a recent graduate preparing for a state board examination, and many conversations with recently graduated and licensed men concerning their educational and professional experiences, before and since leaving college, prompted the setting forth of these thoughts on paper.

I am acutely aware of how easy it is to criticize. The critic must expect to stop an occasional brick-bat from those who resent his presumption in electing himself judge of them and their pretensions. If, after reading this, some one solemnly pronounces me a blood brother to the jackass, I have a short reply: They MAY be right.

It is not my intention to jeer at the so-called "old timer" or patient and kindly educators. They have given and suffered much that our profession might advance. Without apology for repeated use of the perpendicular pronoun, I propose to state the facts as I see and have experienced them, and, with a shocking disregard for the feelings of many estimable men who are, undoubtedly, doing what they think best according to their lights, thought I may deem their illumination of very poor quality and distribution. Some will accuse me of trying to stir up strife, others of pointing out the obvious.

Why speak of unpleasant things? "In great need we must recur to desperate remedies." At times a bit of self-examination and truth-telling are, indeed, desperate remedies. If we lack the courage to conduct a self examination and to face the facts as found, we decay.

As do the politicians, so shall I "point with pride and view with alarm." If, in passing judgment, I err, I invite your attention to the fact that frequently a judgment has nothing to do with justice. An erring judge may plead in excuse the misleading nature of the evidence.

Let us now discuss the ethical (?) treatment accorded our young practitioners of today and later inquire as to whether or not we are giving him a square deal while in college.

Over two decades ago when I entered the optometrical field I anticipated reasonably decent and ethical treatment from my fellow practitioners. Did I get it? As a rule—NO! Neither did you when you started out. I have the soul-searing remembrance of petty politics and annoyances, snake-like jealousies, personal and professional attacks, anything in an effort to discredit me and hinder my getting a start in practice, shunned like a man thrown out from a ship to sink or swim. Speaking of these things to other young practitioners elicited the fact that they were getting the same treatment.

About this time there came into my possession, letters from a "leading light" (?) in our profession (in his own handwriting) wherein he belittles an honest colleague and grossly insults him. Why? Because he was playing peanut politics in an effort to hold his place on a state board of examiners and was playing up to one of his political satellites, an old and long established practitioner, who was then engaged in the very laudable occupation of trying to "run the new man out of town." In another he bluntly tells a reputable practitioner in another state NOT to try and obtain a license to practice in his state because he "would not get by the board." It is interesting to note at this time that the young man he then warned against trying to pass the state board examination is now a writer of exceptionally well received scientific articles and has served, with

distinction, as secretary and president of the state board in his home state. How encouraging to a young man trying to establish himself in practice! Can you honestly call it ethical or call this a square deal?

However, as these things pass through my mind now, softened by distance, by the tenderness of remembered kindness, there stands out in bold relief the actions of three good and truly great men, all the so-called "old timers." Their interest and help in solving difficult problems of practice, their wise counsel ever urging me on and smoothing the way, schooling me to restrain my tongue when lashed to the raw by outrageously unkind and unprofessional treatment by older practitioners is, indeed, a pleasant remembrance. I will never forget the time, shortly after hanging out my shingle, when I went to a state convention and one of the good old doctors, seeing me enter the room, hurried across the floor to give me a hearty hand-clasp, saying, "I'm mighty glad to see you boy! How are you getting along? Can I do anything to help you in any way?" Later, turning to introduce me to an older man, he said, "This boy has just started out for himself and I am interested in his progress. We should give these young men our heartiest support as they must carry on when we pass by. I fear there is too little of the right kind of attention given them."

The old doctor has passed on to his reward. God rest his soul! Criticize him, enumerate his faults if you will. He was intensely human and, therefore, lovable. My most cherished thought is, "He was my friend."

Look about you and you will be confronted with the disagreeable fact that our young men of today are receiving the same unethical treatment accorded you and me decades ago. Some one has said, "The safety of his guest is as the breath of life to the Castilian." The safety of our young men, on whom rest the future fame and success of our profession, SHOULD be as the very breath of life to us. IS IT? YOU answer!

Do you give any thought to the fact that these young colleagues (there are no competitors in a profession) of ours are men like you, having the same virtues, faults and fears, the same instinct to succeed and prosper, the same desire to conduct an ethical practice and the unsatisfied desire for some real cooperation. What are YOU doing toward the elimination of unfair practices and the extension of real help and cooperation to our young men? Knowing the facts are you sneakingly ignoring them or are you frankly and obviously against them?

"A bove majori discit arare minor!" Beginners need to draw on the ideas of older and experienced men. Unless they can associate with and talk freely to a few mature men in their chosen profession, they will not develop progressive thinking along right lines. It is our duty, by precept and example, by willing and loyal sacrifice, to help in the proper training of these fine young and enthusiastic successors of ours.

Let us now consider the educational side of our problem. No intelligent practitioner will argue against the great benefits accruing from the raising of our educational standards during the past few years. However, as is usually the case when educational standards are raised, the pendulum now swings to the other extreme, especially in the state and university controlled schools.

Many of the institutions are turning out graduates who, to me, appear to be a cross-section of physicist, chemist, electrician and illuminating engineer, long on theory and decidedly short on practical knowledge, particularly optometric knowledge. Some of these young chaps seem to think that, having gone to college and learned to conjugate and wear suspenders, they are possessed of the sum total of optometric knowledge, little realizing that competent practitioners are NOT made by four, or forty, years of college work; that a diploma and a license to practice are but evidences of having some ability to acquire a real education in the university of experience. Other young men graduate with a feeling of not having been given a square deal while in college, very much dissatisfied with their almost total lack of practical knowledge and training. The blame for these conditions must be squarely placed on the shoulders of the college and its teachers.

It seems to me that the fundamental idea of an optometry school should be to prepare the person taught to **practice** optometry. In the days when there were more privately owned and controlled schools they never lost sight of the fact that their very existence depended on their ability to turn out well trained, **practical** men. As a result, a very high percentage of their graduates were eminently successful. Much of the instruction given our present day students is superfluous and wholly misleading and must be unlearned in practice and, as a result, we behold the sorry spectacle of our recent graduates "rabbit hunting with a cannon."

The 1926-27 catalog of one of our leading colleges announces that a part of the first year is spent in reviewing elementary high school work. As the law requires evidence of satisfactory high school work for matriculation it seems to me that the time spent in reviewing high school work to "pad out" a college course could be more profitably spent in the clinic. Too little time is spent on practical optometric work and far too much wasted on a lot of pseudo-scientific "flap doodle." For instance, psychology. I personally believe that the major portion of man's knowledge of psychology is obtained by contact with his fellows. Not from books.

And using one of our well advertised colleges as an example let us see how much practical training some of our recent graduates are getting. Four years ago, I understand, a class of thirty-five students were getting four hours a week in theoretical and practical optometry. The year totaled forty weeks with four weeks lost to vacations and mid-year examinations. This without tools or machinery.

The following year, at the end of the second semester, the college installed three much abused Simplex grinders, one drill without a diamond and one buff head. You can imagine the amount of practical training each student received with three machines for thirty-five students. That year ended with the class protesting as to equipment.

The following year the machinery was moved to another floor (used for other classes) where it was exposed to tampering and both use and abuse when the students so pleased to use it. The instructor complaining that under such conditions it was impossible to keep the outfit in condition to turn out work that was anywhere near standard. It was at this time that the dean gave the instructor an assistant to teach practical bridge bending and fitting in the person of an **under-graduate.** It gave the students more hours but less actual practice. The department head then placed an order for a fair amount of frames and mountings to be used in this work. An appeal to the dean for more materials and equipment for practical work brought forth a refusal, he pleading lack of funds yet at the same time he did however, engineer the purchase of much physical equipment for teaching of physics such as a thirty-inch tube barometer with centigrade thermometers attached and a Wheatstone bridge for electrical demonstration at a cost of about $2,000.00.

No one can honestly accuse me of not having always stood four-square for proper educational preparation and adequate instrumentation. I doubt if any one has said and written more (Gene Wiseman excepted) about the deplorable fact that far too many of our older practitioners (who ought to know better) are, in this advanced day and age, still practicing in offices furnished in early Barnum and Bailey.

Educationally, we appear to be divided into four classes. First, the antiquarian who clings to the old, scorning all that is new. Second, the other extreme, the modernist who blatantly berates all that is old, formulating his own theories, some of which are tenable, others not; wholly ignoring the fact that much he claims to be new is in reality the old in a new dress. Third, the "indifferentsia," who gives but little thought, if any, to either old or new. All three living in a more or less smug, self-sanctified ignorance. One is, at times, tempted to believe that constructive thinking is rapidly becoming a lost art. Fourth, and all too few in number, are those who are trying to build well and permanently. Carefully scrutinizing all things, both old and new, accepting and using the thing of proven value and rejecting that with little or no value. Making an honest effort to distinguish between

trash and treasure. Francis Bacon put it neatly when he said, "some dispositions evince an unbounded admiration for antiquity, others eagerly embrace novelty; only a few can preserve the just medium, and neither tear up what the ancients have correctly established, nor despise the just innovations of the moderns."

Let us consider the things of proven value in the training of our successors. It is generally recognized that the minimum entrance requirement for the study of optometry should be graduation from a standard four-year high school course that gives the student not less than fifteen Carnegie Units of work, the majority of which must be in English, Mathematics, History and Civics and General Science, or its equivalent.

The college professional course should be of four years' duration and, while I am opposed to anything less, I am also convinced that, properly arranged, no more college training is necessary to turn out properly trained and **practically efficient** graduates.

The trouble with our present day optometric colleges seems to be their inability to differentiate the needs of a professional school and a college of liberal arts. The professional school is most decidedly not the place for work leading to an A.B., or a Ph.D, degree.

Knowing that some of our colleges are decidedly weak in practical work I believe they would turn out a higher grade and more practically efficient graduate with a curriculum arranged somewhat as follows:—The first two years to be devoted to the fundamentals of the profession—anatomy, physiology, elementary pathology, physics, chemistry, mathematics, geometrical and physiological optics. The third year devoted to an elaboration of the first two years work, especially in ocular anatomy, physiology, bacteriology and pathology and mechanical optics. The latter half of the third year should lay the groundwork for the fourth or clinical year. The student being instructed in the principles of practice and instrumentation in the clinic and made to serve as clinical clerks for the seniors. The fourth year to be spent wholly in the clinic in actual practice under the supervision of the most competent instructors available. A full year of clinical work will lay a firm foundation on which the graduate can build a useful and practical ability. When the clinic and the practical assumes its proper place as a teaching force our colleges will be conducted on really effective lines.

The recent graduate of today will make an accurate diagnosis in a high percentage of cases having an albuminaric retinitis because they more nearly approach the text-book description; when confronted with a neurasthenic patient with a moderate amount of oblique astigmia or a squirmy youngster with a ciliary cramp, having little or no clinical experience, he will flounder about hopelessly and helplessly.

The senior student in the clinic should be made to check up a case on the history and findings as revealed by his objective and subjective tests and make a record of his diagnosis and prescription. Errors in procedure and diagnosis recorded in ink, and later checked up by his professors is an effective mode of teaching the student to be observing and thorough as well as practical. It greatly stimulates a student to have pointed out to him the obvious things that have escaped his notice. Surely we learn by our mistakes. A properly conducted clinic offers great opportunities for real practical training.

Interesting cases coming to the clinic should be grouped and special clinics held from time to time. These being directed by older practitioners in private practice, they diagnosing and discussing these cases. Students and instructors would have an interest in seeing a mistake made and such a procedure would be an antidote to that educational inbreeding that affects all who think and practice alone. Under such a system the student would see and hear discussed the procedures necessary in handling these patients who are not text-book cases, thereby acquiring a practical knowledge of the technique so necessary to success in private practice.

Shall we train our successors properly and treat them as professional brothers or let the present conditions go on from bad to worse?

REPORTS AND ANNOUNCEMENTS OF SOCIETIES

Official Organ of the Delaware, Iowa, Maryland, Michigan, Minnesota, Nebraska, North Dakota Oklahoma, Pennsylvania and Vermont Optometric Associations.

ASSOCIATE STATE EDITORS

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Dr. C. A. Perrigo, Freemont, Neb.
Dr. J. K. Morris, Erie, Pa.
Dr. M. B. Meyer, Wilmington, Del.

ROCHESTER GRADUATE ON JOURNAL STAFF

Dr. C. H. DeGraff, Optometrist of Monroe, Michigan, was appointed by the Michigan State Association of Optometrists as its official representative on the staff of the American Journal of Optometry. DeGraff is a Rochester School man and has been active in Association work in Michigan for some time. He will be assisted by Drs. C. W. Morris of Lansing; G. O. Ohlsson of Detroit; C. J. Hathaway of Pontiac, and E. H. Arnold of Ann Arbor.

PENNSYLVANIA STATE ASSOCIATION ACTIVITIES

The Pennnsylvania State Association Executive Committee recently adopted the American Journal of Optometry as its official publication. All the members in good standing will automatically receive this Journal as part of the membership benefit.

The State Association is planning to carry on an intensive membership campaign and the following captains have been appointed to take part of their respective zones: Drs. E. T. Meyer, Pittsburgh; John W. Forrey, Lancaster; H. M. Clunk, Reading; J. C. Strauss, Allentown; Wm. N. Updegrave, Johnstown; Harry Golden, Scranton; S. H. Baehr, Erie; F. W. Hayes, Williamsport; Harry E. Gohl, Harrisburg, and John H. Martsch, Philadelphia.

The captains are working with their committees to see every registered optometrist of their zone that is eligible to membership and invite him to become a member of their local, state and national association.

The Lancaster and Reading Optometric Associations held a dinner on November 1st, at 7 o'clock and was addressed by Dr. Geo. Warren of Washington, D. C. Dr. Warren's address was on the business end of Optometry and was attended by forty-two optometrists from both Reading and Lancaster Associations. The dinner and lecture was held at Ephrata, situated half-way between Reading and Lancaster, Penn. The above is a good plan for other locals to hold meetings jointly half-way between the local headquarters.

The Erie Optometric Association will entertain Dr. Wm. A. Mendelsohn, of Chicago, Illinois, at dinner and hear his lecture on "Ocular Myology," on Friday, December 16th, 1927. Dinner will be served at 6:30 P. M. Optometrists from Erie, Penn., and vicinity are urged to attend. For reservations write or call, Dr. J. K. Morris, 705 Commerce Bldg., Erie, Pa., Secretary of the Erie Optometric Ass'n.

HARTFORD COUNTY OPTOMETRIC ASSOCIATION

Dr. A. M. Skeffington conducted the second annual Graduate Clinic at Hartford, Connecticut, the week of November 14. A large number of optometrists attended and in the opinion of Dr. F. E. Harrigan, President of the Association, the Clinic this year was even of more value than that of last. This is the second of five Clinics to be held in Hartford.

MARYLAND BOARD OF EXAMINERS

The next standard examination will be held in the office of Secretary J. Fred Andreae on the second Tuesday and Wednesday, January 10th and 11th, 1928.

DR. J. FRED ANDREAE,
Secretary.

OKLAHOMA SECRETARY DEVISES STANDARD PRICE SCHEDULE

Dr. E. B. Alexander, Secretary of the Oklahoma State Association devised and copyrighted a price schedule for lenses which should help to standardize the prices of all types of ophthalmic lenses.

The schedule is so ingeniously arranged that the price of any lens in use today is placed on one side of a 5x8 inch card in such

a way that it can be located at a glance. The prices are given for single lenses only.

Dr. E. B. Alexander, who is located at Duncan, Oklahoma, will be pleased to co-operate with any individual or organization interested in adopting his standardized schedule.

MEETING OF THE HEAD-OF-THE-LAKES ASSOCIATION

On November 10th, Dr. Carl F. Shepard, of Chicago, gave a most interesting talk on "Optometric Technique," and on the following night demonstrated the Myoculator to a much interested group of optometrists.

A fine turn-out, including Duluth, the Iron Range towns and Two Harbors, Minnesota, shows a keen interest in the latest procedure for developing fusion.

DR. A. RUDOLPH BURQUIST,
Secretary.

NORTH DAKOTA ASSOCIATION SPONSORS ESSAY CONTEST

Dr. A. S. Anderson, Secretary of the North Dakota Optometric Association announces that the essay contest, "Good Eyes Essential to Success" as sponsored by the Association is fast becoming a splendid success. At the date of publication over 30,000 pieces of optometric eyesight conservation material had been distributed to Grade School students and essays were coming in from all parts of the State. The rules for the contest were as follows:

This contest is open to North Dakota School children from the fifth to the eighth grades, inclusive.

The contestant whose essay, in the opinion of the judges, is considered the best shall be awarded the first prize of $50. There will be a second prize of $20, a third prize of $10, and fourth, fifth, sixth, and seventh prizes of $5 each.

Each pupil who submits an essay will receive a card certificate from the Association entitling the pupil to an examination of his or her eyes, without cost, upon presenting the card to any one of the optometrists whose name it bears.

The purpose of this essay contest is to bring to the school children of North Dakota a greater realization of the important part their eyes play in their everyday lives, to acquaint them with the simplest rules of eye care and hygiene, and to enable them to have a thorough eye examination by an expert that will reveal whether or not the eyes need help.

All essays must be received at the office of the North Dakota Optometric Association at Williston, North Dakota, on or before December 15, 1927. The judges will reach their decision in time for the prizes to be awarded the day before Christmas, December 24, 1927.

Officers of the Association will be the judges.

The total number of words of any essay must not exceed 800 words, nor be less than 500 words.

Essays must be written in ink, and on one side of the paper only. Neatness and spelling will count. No typewritten essays will be accepted.

Essays must be original, and be accompanied by the written attest of the teacher to that effect.

Children of optometrists are not eligible to compete.

An abundant supply of reference material and information on eye care and hygiene will be sent to each teacher upon request of the Association secretary's office at Williston, for the use of the contestants. Teachers can also obtain additional information by writing to the Eyesight Conservation Council of America, Times Building, New York City, for leaflets on eye care and hygiene.

No essays will be returned under any circumstances, and no correspondence regarding submitted essays can be answered. No return postage should therefore be included. No exceptions will be made to this rule.

All essays should be carefully addressed to: Secretary, N. D. Optometric Association, Box 1003, Williston, North Dakota.

Dr. A. S. Anderson will be glad to give full details of the contest to the Secretaries of any interested Optometric Societies.

OKLAHOMA ASSOCIATION BULLETIN

Department of Education.

The Oklahoma Optometric Association will hold the regular mid-year educational meeting at Tulsa, Oklahoma, at the Mayo Hotel on January 9th to 12th, inclusive.

A series of lectures and clinical demonstrations will be given by Dr. R. M. Peckham, who is coming to Oklahoma for the third time; Dr. H. D. Towsley, chief of the Applied Physics Department of the Cameron Company, and Dr. J. C. Copeland, of New York, inventor of the Copeland Refractoscope. There will also be representatives of the American and Riggs Optical Company.

The mid-year meetings are held each year for purely educational-postgraduate work, under the Educational Department of the State Association. The mid-year meetings were started four years ago, and every year has shown a substantial increase in attendance and interest.

The business meeting of the Association is conducted at the regular annual convention held in April of each year and at meetings of the Board of Directors held throughout the year. This leaves the mid-year meetings for educational and clinical purposes only.

W. S. FARMER, Chairman,
Department of Education.

SPECIAL NOTICE TO THE READERS

The Columbia University Library wishes to complete its file of the American Journal of Optometry for reference use and is lacking the following numbers: Vol. 1, No. 2; Vol. 2, Nos. 6 to 12, inclusive; Vol. 3, No. 3; Vol. 4, No. 10. Our readers, who can spare any of the above mentioned numbers are urged to send them to The Library, Columbia University, New York, N. Y.—Att. D. B. Hepburn, Supervisor Accessions Dept.

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